

**DEPARTMENT OF LICENSING AND REGULATORY AFFAIRS  
RADIATION SAFETY SECTION  
IONIZING RADIATION RULES**

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## PART 6. INDUSTRIAL RADIOGRAPHIC OPERATIONS AND INSTALLATIONS

### R 325.5281. Purpose and scope.

**Rule 281.** (1) This part establishes radiation safety requirements for persons utilizing sources of radiation for industrial radiography and a classification system for industrial radiographic installations and use.

(2) This part applies to all licensees and registrants who use sources of radiation for industrial radiography; however, nothing in this part applies to the use of sources of radiation in the healing arts.

(3) Requirements of this part which refer to radiographic exposure devices or sealed sources apply to the use of radioactive material. Requirements which refer to sources of radiation apply to the use of radiation machines and radioactive material.

(4) In addition to the requirements of this part, all licensees and registrants are subject to the applicable provisions of the other parts.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

### R 325.5282. Definitions.

**Rule 282.** As used in this part:

- (a) "Industrial radiography" means the examination of the macroscopic structure of materials by nondestructive methods utilizing sources of radiation.
- (b) "Installation" means a location, having boundaries specified by the licensee or registrant, where for a period of more than 30 days 1 or more sources of radiation are used, operated or stored. A part of a building, an entire building, a plant or plant site may be designated as an installation.
- (c) "Radiographer" means an individual who performs or who, in attendance at the site where sources of radiation are being used, personally supervises industrial radiographic operations and who is responsible to the licensee or registrant for assuring compliance with the requirements of these rules and all license or registration conditions.
- (d) "Radiographer's assistant" means an individual who, under the personal supervision of a radiographer, uses sources of radiation, related handling tools, or survey instruments in industrial radiography.
- (e) "Radiographic exposure device" means an instrument containing a sealed source fastened or contained therein, in which the sealed source or shielding thereof may be moved, or otherwise

changed, from a shielded to unshielded position for purposes of making a radiographic exposure.

- (f) "Storage container" means a device in which sealed sources are transported or stored.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

## EQUIPMENT CONTROL

### R 325.5285. Radiation levels for radiographic exposure devices and storage containers.

**Rule 285.** Radiographic exposure devices measuring less than 10 centimeters (4 inches) from the sealed source storage position to any exterior surface of the device shall not have a radiation level in excess of 50 milliroentgens per hour at 15 centimeters (6 inches) from any exterior surface of the device. Radiographic exposure devices measuring a minimum of 10 centimeters (4 inches) from the sealed source storage position to any exterior surface of the device, and all storage containers for sealed sources or outer containers for radiographic exposure devices, shall not have a radiation level in excess of 200 milliroentgens per hour at any exterior surface, or 10 milliroentgens per hour at any exterior surface. The radiation levels specified are with the sealed source in the shielded (i.e., "off") position.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

### R 325.5286. Locking of sources of radiation.

**Rule 286.** (1) Each source of radiation shall be provided with a lock or outer-locked container designed to prevent unauthorized or accidental production of radiation or removal or exposure of a sealed source and shall be kept locked except when under the direct surveillance of a radiographer or radiographer's assistant, or as may be otherwise authorized by the department.

(2) Each storage container shall be provided with a lock and kept locked when containing sealed sources except when under the direct surveillance of a radiographer or radiographer's assistant.

(3) Locked sources of radiation and storage containers shall be physically secured to prevent tampering or removal by unauthorized personnel.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the*

*purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5287. Radiation survey instruments.**

**Rule 287. (1)** A licensee or registrant shall maintain calibrated and operable radiation survey instruments to make physical radiation surveys as required by this part and part 5. Each radiation survey instrument shall be calibrated at intervals not to exceed 3 months and after each instrument servicing. A record of such calibration shall be maintained for examination by the department.

(2) Instrumentation required by this rule shall have a range such that 2 milliroentgens per hour through 1 roentgen per hour can be measured and shall be capable of measuring radiation of the energies and at the dose rates to be encountered.

(3) During repair or calibration of survey instruments required by this rule, spare operable and calibrated instruments shall be provided or radiographic operations shall be terminated pursuant to rule 307(1).

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5288. Replacement, leak testing, repair, tagging, opening and modification of sealed sources.**

**Rule 288. (1)** The replacement of a sealed source fastened to or contained in a radiographic exposure device and leak testing, repair, tagging, opening, or any other modification of a sealed source shall be performed only by persons specifically authorized to do so by the department, the AEC or an agreement state.

(2) A sealed source shall be tested for leakage at intervals not to exceed 6 months. In the absence of a certificate from a transferor that a test has been made within the 6-month period before the transfer, the sealed source shall not be put into use until tested.

(3) The leak test shall be capable of detecting the presence of 5 nanocuries of removable contamination on the sealed source. An acceptable leak test for sealed sources in the possession of a radiography licensee would be to test at the nearest accessible point to the sealed source storage position, or other appropriate measuring point, by a procedure to be approved pursuant to rule 108(e). Records of leak test results shall be kept in units of nanocuries and maintained for inspection by the department.

(4) A test conducted pursuant to this rule which reveals the presence of 5 nanocuries or more of removable radioactive material shall be considered evidence that the sealed source is leaking. The licensee shall immediately withdraw the equipment involved from use and shall cause it to be decontaminated and repaired or to be disposed of, in accordance with these rules. Within 5 days after obtaining results of the test, the licensee shall file a report with the

department describing the equipment involved, the test results, and the corrective action taken.

(5) A sealed source which is not fastened to or contained in a radiographic exposure device shall be permanently attached to it a durable tag at least 1 inch square bearing the prescribed radiation caution symbol in conventional colors, magenta or purple on a yellow background, and at least the instructions: "Danger – Radioactive Material – Do Not Handle – Notify Civil Authorities if Found."

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5289. Quarterly inventories.**

**Rule 289.** A licensee or registrant shall conduct a quarterly physical inventory to account for all sources of radiation received or possessed by him. The records of the inventories shall be maintained for inspection by the department and shall include the quantities and kinds of radioactive material, the location of all sources of radiation, the date of the inventory, and the signature or initials of the individual certifying the accuracy of the inventory.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5290. Utilization logs.**

**Rule 290.** A licensee or registrant shall maintain for inspection by the department current logs, which show the following information for each source of radiation:

- (a) A description, or make and model number, of each source of radiation or storage container in which the sealed source is located.
- (b) The identity of the radiographer to whom assigned.
- (c) Locations where used and dates of use.
- (d) Signature or initials of the individual certifying each entry.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5291. Inspection and maintenance.**

**Rule 291. (1)** A licensee or registrant shall conduct a program for inspection and maintenance of sources of

radiation and storage containers to assure proper functioning of components important to safety.

(2) A current checklist of inspection and maintenance of sources of radiation and storage containers indicating the date of the last inspection shall be maintained for inspection by the department.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

### CLASSIFICATION

#### R 325.5293. Class enumeration.

**Rule 293.** (1) For the purpose of licensing or registering and approving industrial radiographic installations they shall be classified as class AA, class A, class B or class C.

(2) For the purpose of licensing or registering and approving industrial radiography and sources of radiation intended for limited use at temporary job site locations this use shall be classified as class D operation.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### R 325.5294. Class AA installations.

**Rule 294.** (1) In class AA installations the source of radiation and objects exposed thereto shall be contained within a permanent enclosure.

(2) The enclosure shall be constructed such that the radiation exposure rate as measured in air at a distance of 5 centimeters from any point on the external surface shall not exceed 2 milliroentgens per hour with the source of radiation placed in the shortest source-to-wall radiographically usable position under conditions of maximum radiation output permitted by the design or operating characteristics of the radiographic exposure device or radiation machine.

(3) Mechanical or electrical limiters shall limit movement or alignment of the source of radiation within the enclosure if necessary to comply with subrule (2).

(4) A personnel barrier posted in accordance with rules 224 to 231 restricting access to the roof of the enclosure shall meet the requirement of subrule (2).

(5) Reliable interlocks shall be provided which will prevent anyone from opening the enclosure while the radiation machine is on or the sealed source is unshielded, or which will terminate machine operation or automatically return the sealed source to a shielded position should anyone open the enclosure.

(6) Enclosures of sufficient size to permit human occupancy shall be provided with visible or audible signals or both within the enclosure which are activated a minimum of 5 seconds before radiation machine activation or exposure of the sealed source. Persons shall at all times be able to escape from within the enclosure.

(7) A person shall not be permitted to remain within the enclosure while the radiation machine is in operation or the sealed source is unshielded.

(8) Protective enclosures and equipment shall be kept in good repair.

(9) Industrial fluoroscopy shall meet class AA requirements.

(10) Notwithstanding the provisions of subrule (2), the enclosure for industrial fluoroscopy shall be constructed such that the radiation exposure rate as measured in air at a distance of 5 centimeters from any accessible point on the external surface shall not exceed 0.5 milliroentgens per hour under conditions of maximum radiation output permitted by the design or operating characteristics of the installation.

(11) Industrial cabinet radiography conducted in enclosures of insufficient size to permit human occupancy shall meet class AA requirements.

(12) Notwithstanding the provisions of subrule (2), the enclosure for industrial cabinet radiography of insufficient size to permit human occupancy shall be constructed such that the radiation exposure rate as measured in air at a distance of 5 centimeters from any accessible point on the external surface shall not exceed 0.5 milliroentgens per hour under conditions of maximum radiation output permitted by the design or operating characteristics of the installation.

(13) Class AA approval permits unlimited use at maximum capacity.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### R 325.5296. Class A installations.

**Rule 296.** (1) Class A installations shall comply with all requirements of rule 294 except for a permissible exposure rate of 7 milliroentgens per hour at any accessible external point.

(2) A personnel monitoring device such as a film badge dosimeter or thermoluminescent dosimeter, shall be permanently assigned to each occupationally exposed individual. This monitoring shall be continuous during employment as a radiation worker.

(3) Personnel exposure records shall be kept on permanent available file at the facility where the exposure occurs for inspection by the department.

(4) Class A approval permits unlimited use at maximum capacity.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5297. Class B installations.**

**Rule 297.** (1) Class B installations shall comply with all requirements of rule 296.

(2) Radiation machine current and potential controls shall be mechanically or electrically limited so as not to exceed the normal operating conditions as specified by the registrant at the time of application for registration.

(3) Class B approval permits unlimited use under normal operating conditions as specified by subrule (2).

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5298. Class C installations.**

**Rule 298.** (1) Class C installations shall comply with all requirements of rule 296 except for a permissible exposure rate of 50 milliroentgens per hour at any accessible external point.

(2) The maximum weekly exposure time of sources of radiation within the enclosure shall be established by the department under the conditions specified by the licensee or registrant at the time of application.

(3) Warning signs shall be posted in those areas outside the enclosure in which the radiation exposure rate in air at any accessible external point exceeds 2 milliroentgens per hour with the source of radiation placed in the shortest source-to-wall radiographically usable position under conditions of maximum radiation output permitted by the design or limited operating characteristics of the radiographic exposure device or radiation machine.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

**R 325.5299. Class D operations.**

**Rule 299.** (1) Industrial radiography conducted under conditions not meeting the provisions and requirements of rules 294 to 298 shall be classified as class D operations and shall not be operated longer than 30 days unless written authorization is granted by the department.

(2) Written authorization may be granted by the department for class D operations longer than 30 days but not longer than 6 months when an undue and unnecessary hardship may result from the 30 day limitation. Written request by the licensee or registrant for this authorization is required and shall describe the hardship involved as well as

provide written assurance of compliance with the requirements of these rules for class D operation.

(3) Notwithstanding subrules (1) and (2) a person routinely engaged in providing industrial radiography services with mobile or portable sources of radiation at temporary job site locations may conduct such class D operations without time limitation subject to the following conditions:

- (a) The person shall hold an unexpired certificate of registration from the department or specific license from the department, the NRC or an agreement state.
- (b) The person shall give written notice to the department at least 2 working days before starting radiographic work at a job site. The notice shall include the radiographer's name; a description of each source of radiation; the nature, duration and scope of use; and the exact location of each job site. If for a specific case the 2 working-day period would impose an undue hardship on the person, upon application to the department, he may arrange for other notification to comply with the intent of this requirement.
- (c) These class D operations shall be limited to locations and circumstances which cannot meet the provisions and requirements of permanent installation classification without undue and unnecessary hardship.
- (d) A copy of written operating and emergency procedures shall be filed with and approved by the department.
- (e) Upon reasonable notice from the department the person shall submit to the department or otherwise make available copies of specific records pertaining to radiographic operations and personnel conducting these operations within this state.

(4) A fence, rope or other suitable barrier shall be erected along the 5 mR/hr contour line during class D radiographic operations to exclude unauthorized persons from the radiation area.

(5) The radiation area and high radiation area shall be posted with caution signs as specified in rules 224 to 231.

(6) A personnel monitoring device such as a film badge dosimeter or thermoluminescent dosimeter, shall be permanently assigned to each occupationally exposed individual. This monitoring shall be continuous during employment as a radiation worker.

(7) Personnel exposure records shall be kept on permanent available file for examination by the department. A copy of the most recent record including current, quarterly, annual and lifetime cumulative totals for each monitored individual present at a temporary job site shall be available at the job site for examination by the department. A current supplemental daily dosimeter log shall also be available at the job site.

(8) The inside of the driver's compartment of the transport vehicle used to transport class D radiographic exposure devices shall be conspicuously posted with emergency instructions including the procedure for notifying the Michigan Department of Public Health, the Michigan Department of State Police, and other emergency agencies in event of accident or fire and the procedure for minimizing exposure to persons in the event of an accident.

(9) Written operating and emergency procedures shall be available at each class D radiographic operation.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

*[Note: As a result of Executive Orders 1996-1, 1996-2, 2003-18 and 2011-4 the authority, powers, duties, functions, and responsibilities of the radiation machine registration, licensing, and compliance program were transferred to the Michigan Department of Licensing and Regulatory Affairs. With respect to machine sources of ionizing radiation, any reference in these rules to the Michigan Department of Public Health should now reference the Michigan Department of Licensing and Regulatory Affairs.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### **SAFETY FOR RADIOGRAPHERS AND RADIOGRAPHERS' ASSISTANTS**

##### **R 325.5301. Limitations.**

**Rule 301.** (1) A licensee or registrant shall not permit an individual to act as a radiographer until the individual:

- (a) Has been instructed in the subjects outlined in rule 309 and has demonstrated understanding thereof.
- (b) Has received copies of and instruction in the rules contained in this part and the applicable sections of part 5, license or registration conditions and the licensee's or registrant's operating and emergency procedures, and has demonstrated understanding thereof.
- (c) Has demonstrated competence to use the source of radiation, related handling tools, and survey instruments which will be employed in his assignment.

(2) A licensee or registrant shall not permit an individual to act as a radiographer's assistant until the individual:

- (a) Has received copies of and instruction in the licensee's or registrant's operating and emergency procedures, and has demonstrated understanding thereof.
- (b) Has demonstrated competence to use under the personal supervision of the radiographer the sources of radiation, related handling tools and radiation survey instruments which will be employed in his assignment.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

##### **R 325.5302. Operating and emergency procedures.**

**Rule 302.** A licensee's or registrant's written operating and emergency procedures shall include instructions in at least the following:

- (a) The handling and use of sources of radiation to be employed such that an individual is not likely to be exposed to radiation doses in excess of the limits established in part 5.
- (b) Methods and occasions for conducting radiation surveys.
- (c) Methods for controlling access to radiographic areas.
- (d) Methods and occasions for locking and securing sources of radiation.
- (e) Personnel monitoring and the use of personnel monitoring equipment.
- (f) Transportation to field locations, including packing of sources of radiation in the vehicles, posting of vehicles, and control of sources of radiation during transportation.
- (g) Minimizing exposure of persons in the event of an accident.
- (h) Procedure for notifying proper persons in the event of an accident.
- (i) Maintenance of records.
- (j) Inspection and maintenance of sources of radiation and storage containers.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

##### **R 325.5303. Personnel monitoring control.**

**Rule 303.** (1) A licensee or registrant shall not permit an individual to act as a radiographer or as a radiographer's assistant unless, at all times during radiographic operation, the individual wears a long-term monitoring device such as a film badge or TLD and a short-term monitoring device such as a pocket dosimeter or pocket chamber. Pocket dosimeters and pocket chambers shall be capable of measuring doses from 0 to at least 200 milliroentgens. Each long-term monitoring device shall be assigned to and worn by only 1 individual.

(2) Pocket dosimeters and pocket chambers shall be read and doses recorded daily. A film badge or similar device shall be immediately processed if a pocket chamber or pocket dosimeter is discharged beyond its range. All personnel exposure reports and records of pocket dosimeter and pocket chamber readings shall be maintained for inspection by the department.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### **PRECAUTIONARY PROCEDURES IN RADIOGRAPHIC OPERATIONS**

##### **R 325.5305. Security.**

**Rule 305.** (1) During each radiographic operation, the radiographer or radiographer's assistant shall maintain a direct

surveillance of the operation to protect against unauthorized entry into a high radiation area, except where the high radiation area is equipped with interlocks as described in rule 294 (5), or where the high radiation area is locked to protect against unauthorized or accidental entry.

(2) A radiographer or radiographer's assistant shall not perform or permit radiographic operation unless all persons present in or entering the resulting radiation area are wearing film badges or thermoluminescent dosimeters. Radiographic operation shall cease if an unmonitored person enters the radiation area and shall not resume until the person is monitored or leaves the area.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### **R 325.5306. Posting.**

**Rule 306.** Notwithstanding any provision in rule 233, areas in which radiography is being performed shall be conspicuously posted as required by rules 224 to 231.

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### **R 325.5307. Radiation surveys and survey records.**

**Rule 307. (1)** A radiographic operation shall not be conducted unless calibrated and operable radiation survey instrumentation as described in rule 287 is available and used at each site where radiographic exposures are made.

(2) A physical radiation survey shall be made after each radiographic exposure utilizing radiographic exposure devices or sealed sources of radioactive material to determine that the sealed source has been returned to its shielded condition.

(3) A physical radiation survey shall be made to determine that each sealed source is in its shielded condition before securing the radiographic exposure device or storage container as specified in rule 286. Records shall be kept of these surveys and maintained for inspection by the department.

(4) A physical radiation survey shall be conducted to determine that the radiation machine is off before each entry into the radiographic exposure area.

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.

#### **R 325.5309. Appendix A - Instruction of radiographers.**

**Rule 309.** See rule 301.

##### **I. Fundamentals of Radiation Safety**

- A.** Characteristics of gamma and x-radiation
- B.** Units of radiation dose (mrem) and quantity of

radioactivity (curie)

- C.** Hazards of excessive radiation exposure
- D.** Levels of radiation from sources of radiation
- E.** Methods of controlling radiation dose
  - 1.** Working time
  - 2.** Working distances
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##### **II. Radiation Detection Instrumentation to be Used**

- A.** Use of radiation survey instruments
  - 1.** Operation
  - 2.** Calibration
  - 3.** Limitations
- B.** Survey techniques
- C.** Use of personnel monitoring equipment
  - 1.** Film badges, thermoluminescent dosimeters
  - 2.** Pocket dosimeters
  - 3.** Pocket chambers

##### **III. Radiographic Equipment to be Used**

- A.** Remote handling equipment
- B.** Radiographic exposure devices and sealed sources
- C.** Storage containers
- D.** Operation and control of x-ray equipment

##### **IV. The Requirements of Pertinent Federal and State Regulations**

**V.** The Licensee's or Registrant's Written Operating and Emergency Procedures

##### **VI. License or Registration Conditions**

*[Note: The requirements of this rule that pertain to radioactive material licensing or compliance are under the purview of the Michigan Department of Environmental Quality.]*

History: 1954 ACS 85, Eff. Dec. 3, 1975.